

The Spatial-temporal Exploration of Health and Housing Tenure Transitions Using the Northern Ireland Longitudinal Study



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 - Health (non)transitions by LISA area typologies
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 - Remaining bad health (2001-11) – *tenure & health entrapment*
 - Transitioning good to bad health / LTILL (2001-11) : comparative (*different census questions for response*)
- Conclusions

Introduction

- Extensive literature on inter-relationships between: health variations/inequalities, housing tenure, and wider dimensions of social wellbeing
 - ditto measurement of these
 - done at both the 'individual' & 'area' level
 - compositional vs. contextual explanations
 - geographical & socioeconomic variations
 - e.g. Marmot (2010), Macintyre et al (2002)
- Smith & Easterlow (2005) consider concepts of housing entrapment & selective placement
 - *are people entrapped in poor housing & health?*
 - *are people selectively placed in tenures / spatiality's in poor health?*
 - argue for compositional explanations for health variations, & think contextual overstated (critical of MLM)
- Others considered migration, selections social mobility and consequence for health outcomes (e.g. Boyle & Norman, 2009; Darlington et al, 2015)

Aims

1. To explore relationships between changing general health / limiting long-term illness & housing tenure in Northern Ireland, 2001-2011
2. To re-explore whether changing general health & limiting illness status are linked to different kinds of spatial move/mobility
 - changed/not changed tenure type & changed address (SOA)
 - & whether moves are between different types of place/area (e.g. area deprivation score)
3. To explore whether individuals who are 'entrapped' with respect to tenure/health transitions live in spatial clustered areas

Data and Analytical Approach

- NI Longitudinal Study 2001-2011 individual records
 - using individual Census responses & linked health card registrations
 - yields information on (non)change of address [in addition to decennial info. on (non)changes in SOA & housing tenure]
 - changes/transitions general health & limiting long-term illness (disability)
 - Other relevant individual characteristics
- Ecological data: NI Census Area Statistics
 - multiple deprivation
 - LISA spatial clustering: 5 way area typology for 4 different 2001 & 2011 Census variables (long-term illness & housing tenure)
- Multilevel statistical modelling (individuals nested in SOAs)
 - parsimony, selective set of predictors (informed by literature & what's available Census)
 - cross-level interactions between individual & area variables

Data: Health Questions in the Census

- Ask some health questions in England, Wales, Scotland & Northern Ireland

2001 Census

13 Do you have any long-term illness, health problem or disability which limits your daily activities or the work you can do?

◆ Include problems which are due to old age.

Yes No

11 Over the last twelve months would you say your health has on the whole been:

Good?
 Fairly good?
 Not good?

2011 Census

22 Are your day-to-day activities limited because of a health problem or disability which has lasted, or is expected to last, at least 12 months?

➔ Include problems related to old age

Yes, limited a lot
 Yes, limited a little
 No

24 How is your health in general?

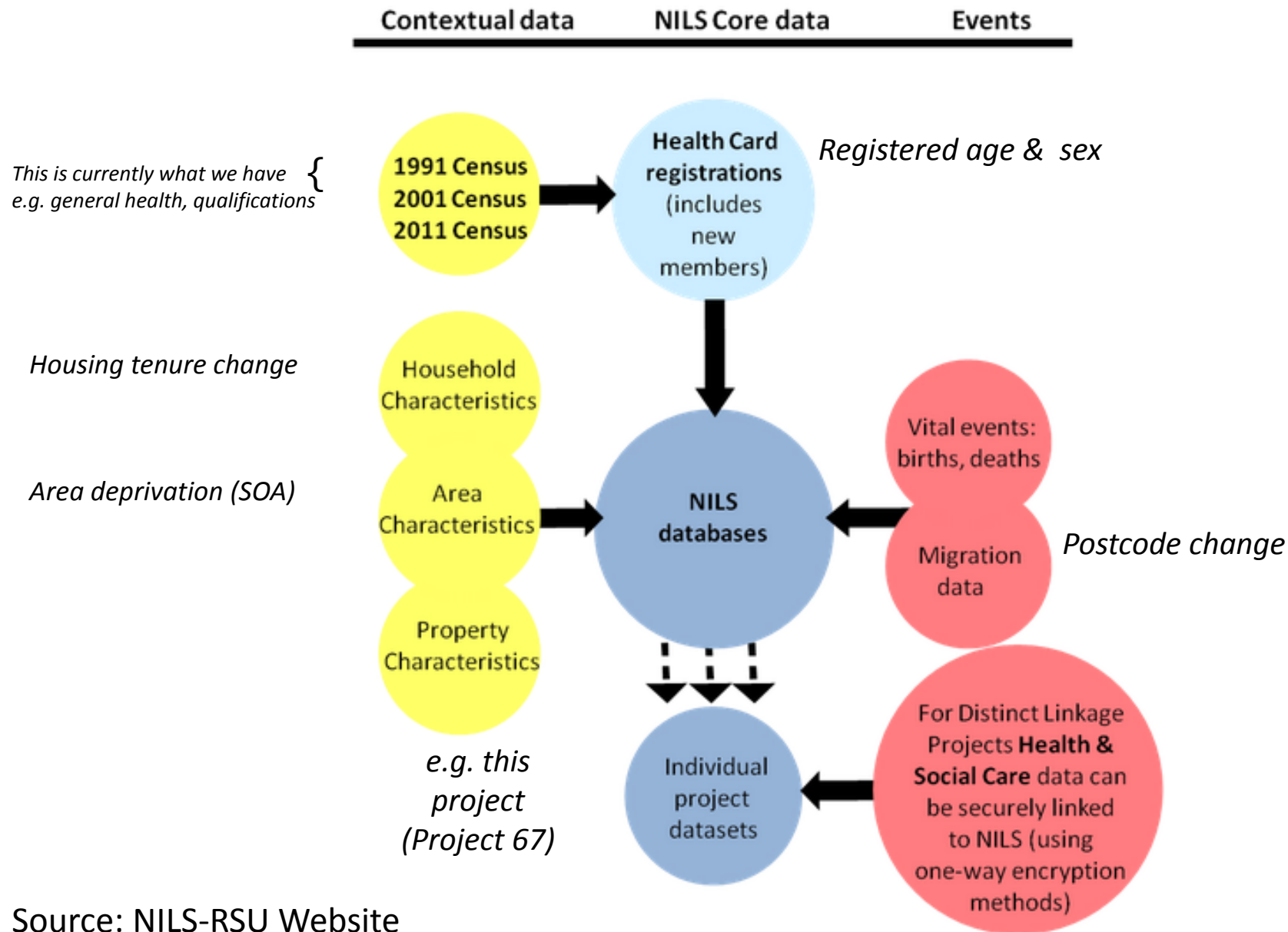
Very good Good Fair Bad Very bad

Northern Ireland Longitudinal Study (NILS)

- Census microdata accessed in a secure data laboratory under supervision



Data: NILS 2001-2011 Structure



Source: NILS-RSU Website

NILS: Population Bases

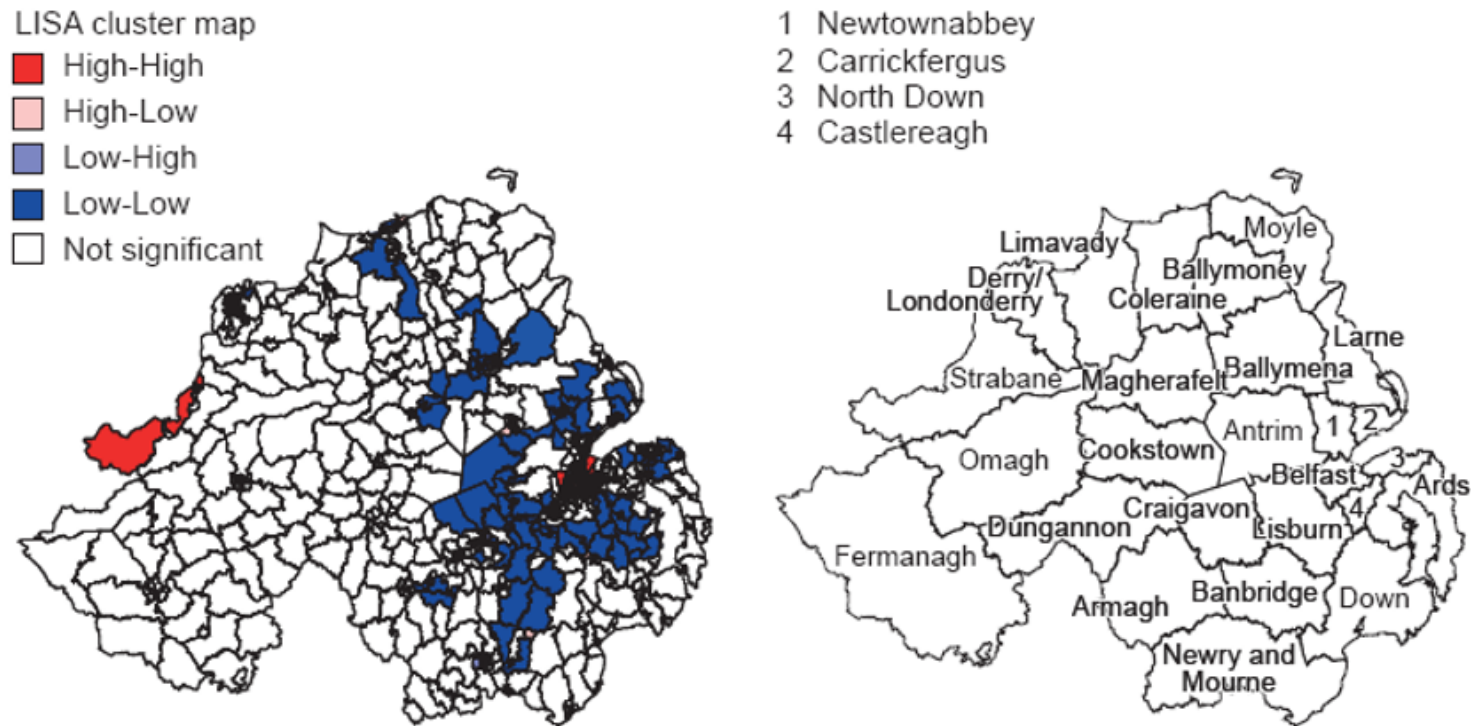
- **Movers – changed tenure**
 - may/may not changed home/address
 - &/or changed SOA
 - theoretically possible to only change tenure - e.g. (re)mortgage, buy from landlord
- **Movers changed address / SOAs**
 - recently been analysing these as 4 ‘interacted’ possibilities
 1. Changed tenure, changed address
 2. Changed tenure, not changed address (unlikely)
 3. Not changed tenure, changed address
 4. Not changed tenure, not changed address

Spatial Concentrations: LISA

- Have uses spatial autocorrelation measure: Local Indicators of Spatial Association - LISA)
 - implemented in Anselin (2005) GeoDa software
- Done this for different 'ecological' variables using NI Census Area Statistics
 - % with LTILL, % owner occupation, %private renting, & % social housing
- Classifies SOAs into five classes:
 - Random: No pattern for SOAs
 - high-high: area & surroundings area have high rates of characteristic
 - high-low: area with high rate, surrounded by areas with low rates
 - low-low: area & surrounding areas have low rates of characteristic
 - low-high: area with low rate, surrounded by areas with high rates
- This is used to explore how spatial context matters in shaping probabilities of (non)-transition in health status
- Basic argument: existing population geographies may be important in entrapping/constraining changing health status

Further information: Anselin L. (2005) *Exploring Spatial Data with GeoDaTM: A Workbook*. Spatial Analysis Laboratory, University of Illinois, <https://geodacenter.asu.edu/system/files/geodaworkbook.pdf>, Chapter 19.

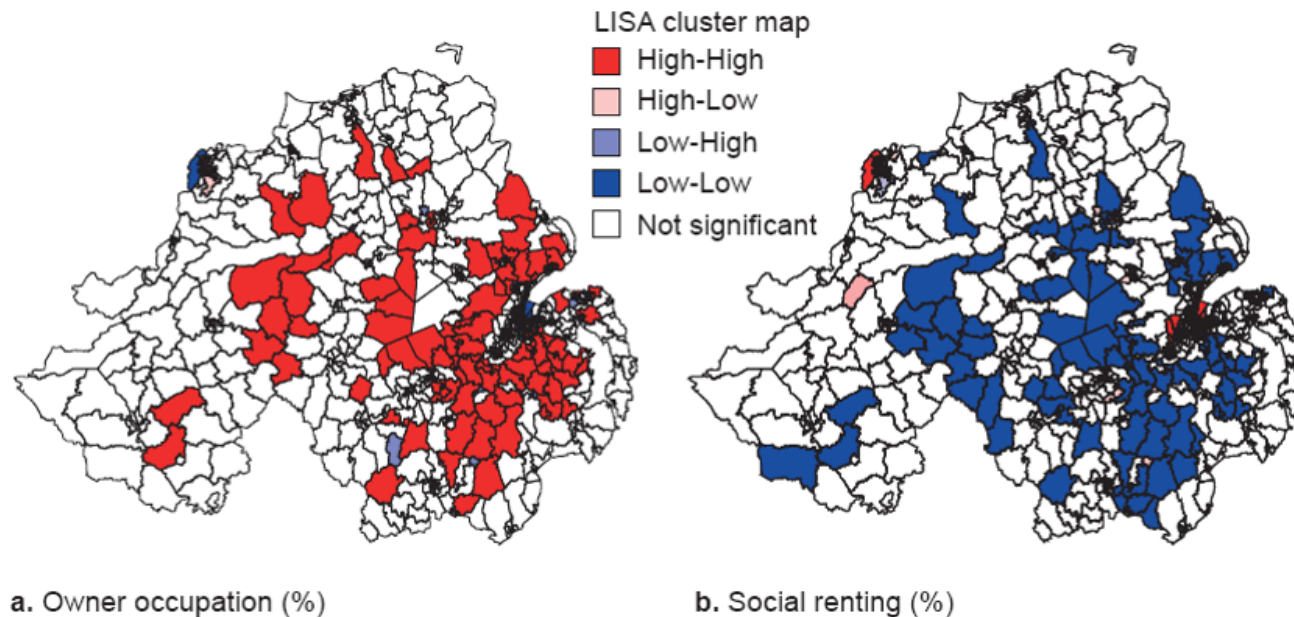
Spatial clustering limiting long term illness by NI SOAs, 2011



Source: NISRA, 2011 NI Census Area Statistics and Digitised Boundary Data

Figure 26.1 LISA mapping of percentage people with very limited long-term illness in 2011

Spatial clustering of housing tenure by NI SOAs, 2011



Source: NISRA, 2011 NI Census Area Statistics and Digitised Boundary Data

Figure 26.2 LISA mapping of **a.** percentage owner occupiers in 2011, and **b.** percentage social renters in 2011

Spatial Concentrations: Health (Non)Transitions

Percentage of NLS members remaining in bad health (2001-2011) classified by 4 different area cluster typologies:

Cluster type (2001)	% Remaining bad (General Health 2001 -2011) by SOA area classification			
	1. Limiting LT illness LISA	2. Owner occupied LISA	3. Private renting LISA	4. Social renting LISA
Random	15.8%	15.9%	16.5%	15.7%
High, high	26.4%	12.3%	17.6%	26.9%
Low, low	10.9%	25.2%	14.3%	12.7%
Low, high	16.2%	17.9%	26.9%	16.6%
High, low	16.6%	17.8%	15.3%	16.2%

- LISA: Local Indicator of Spatial Association
- e.g : 2. Owner Occupier LISA: 25.2% of NLS members remaining ill (2011-11) live in area of low owner occupation surrounded by other areas of low owner occupation

Limiting Long-term Illness (Disability) Transitions: 2001-2011

		Limiting Illness 2011		
		No	Yes	Total
Limiting Illness 2001	No	166,101	39,403	205,504
		<i>80.8%</i>	<i>19.2%</i>	<i>100.0%</i>
	Yes	13,051	42,878	55,929
		<i>23.3%</i>	<i>76.7%</i>	<i>100.0%</i>
	Total	179,152	82,281	261,433
		<i>68.5%</i>	<i>31.5%</i>	<i>100.0%</i>

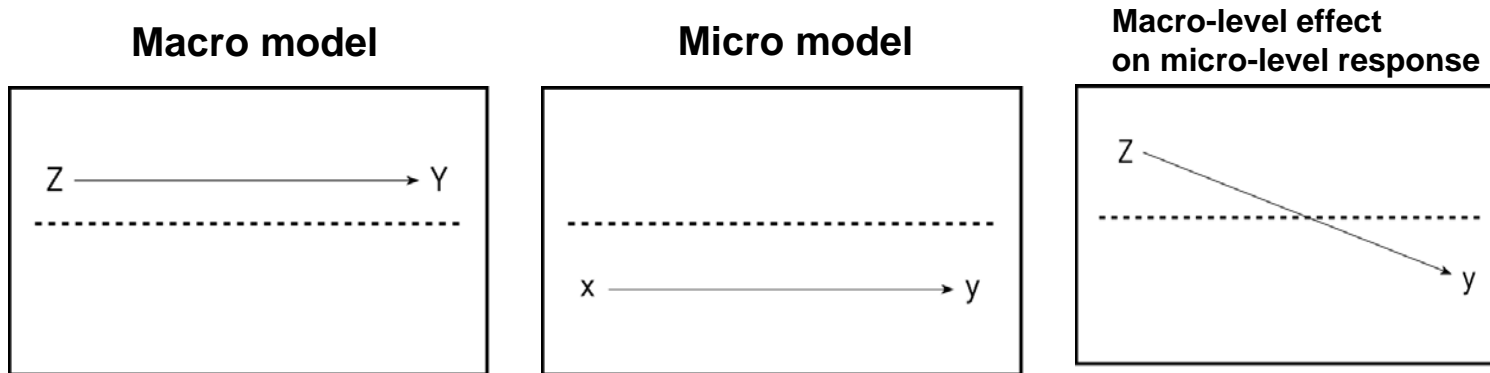
- Illness 2011: 3 categories recoded /combined to 2 to compare with 2001

General Health Transitions: 2001-2011

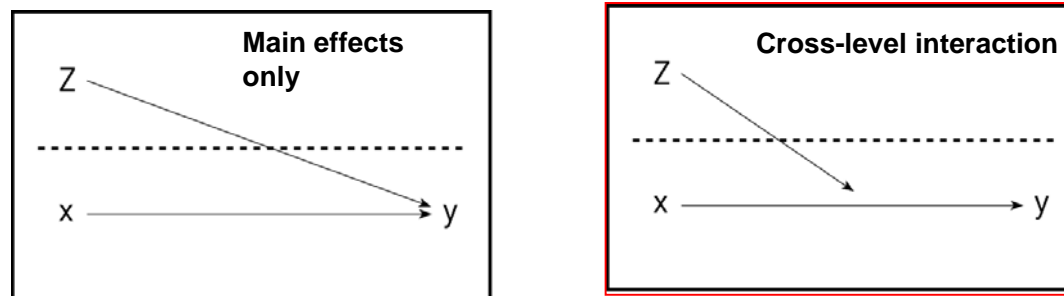
		General Health 2011			
		Good health	Fairly good health	Not good health	Total
General Health 2001	Good health	143503	23012	5458	171973
		83.4%	13.4%	3.2%	100.0%
	Fairly good health	29323	23659	6528	59510
		49.3%	39.8%	11.0%	100.0%
	Not good health	6131	12632	11187	29950
		20.5%	42.2%	37.4%	100.0%
	Total	178957	59303	23173	261433
		68.5%	22.7%	8.9%	100.0%

- Health 2011: 5 categories recoded /combined to 3 to compare with 2001

Family of (Multilevel) Models



Multilevel models

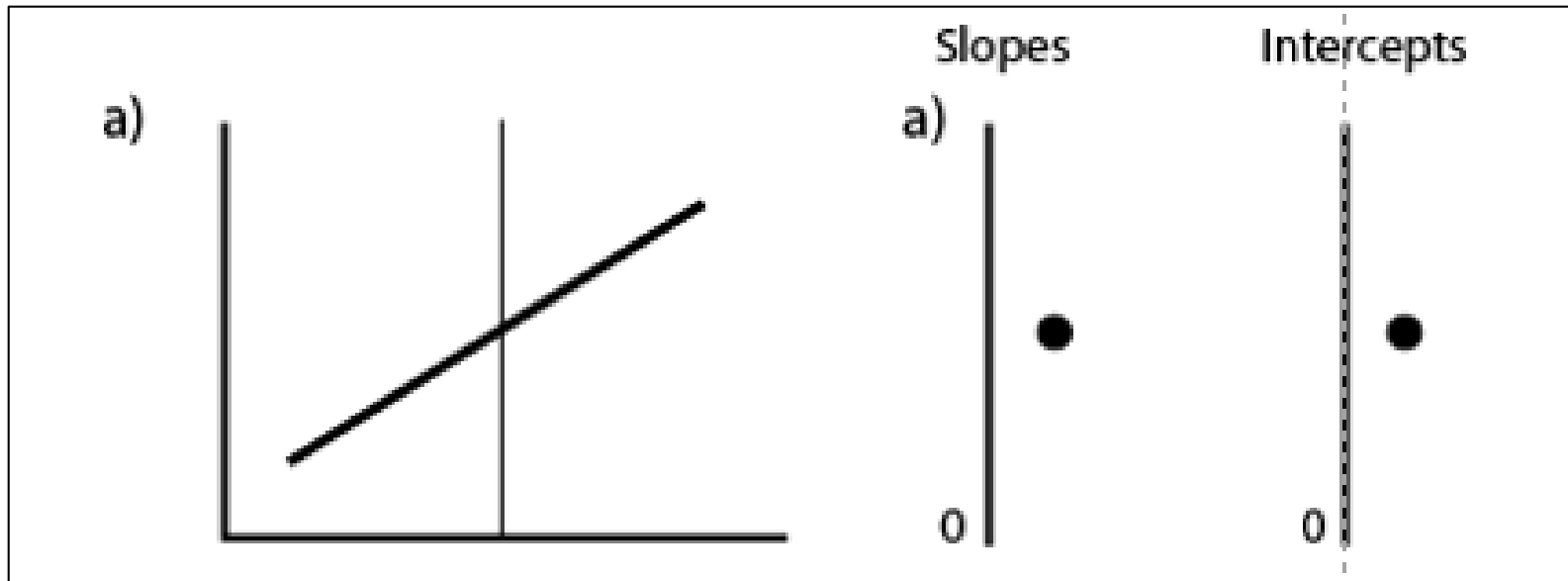


Source: Tacq (1986) cited in Snijders & Bosker (1999)

Multilevel Models

Classical statistical (regression) model

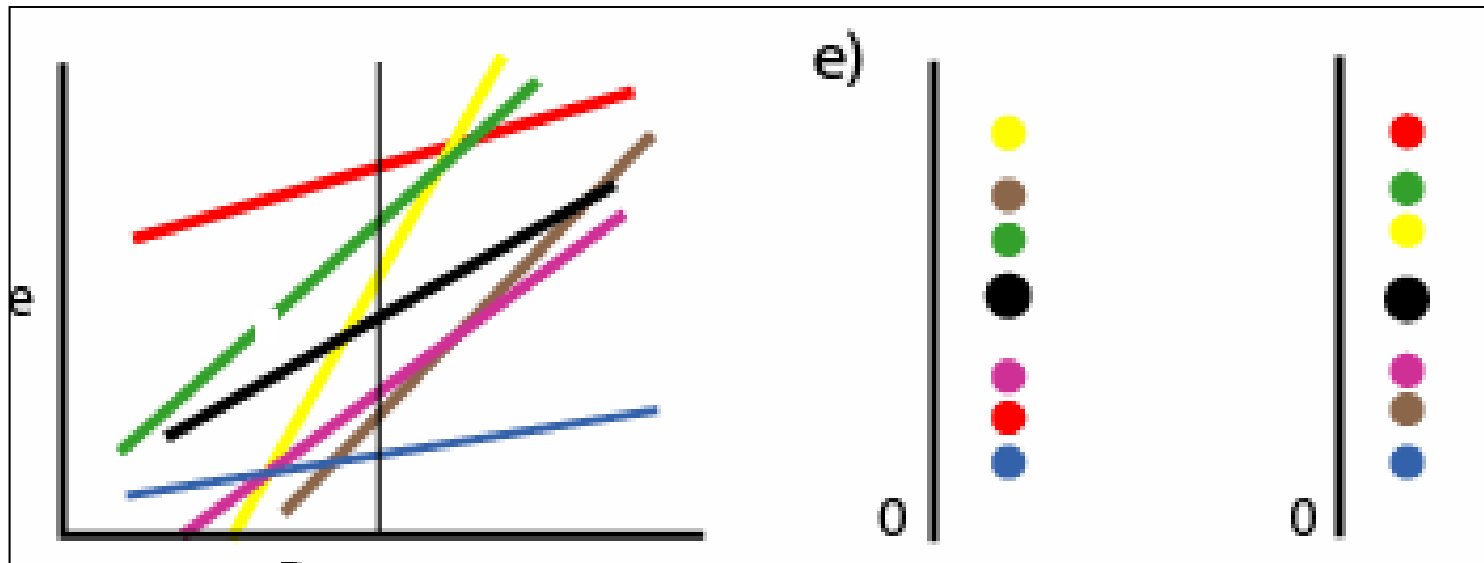
- Fit a 'fixed' relationships everywhere between health and age



Locating Multilevel Models

Contextual variations & compositional differences

- Allow relationships to vary between contexts, not fitting same 'fixed' relationships everywhere



ML Model Predictors

- Having allowed for individual 2001 housing tenure
 - n.b. tenure change in other previous analysis]...
- ...also age, sex, occupational status, education level, & community background
- plus included 2001 LISA typology as main effect
 - in 2 separate models (illustrative)
 - significant effects for some elements of the typologies
- plus allowed for response to vary by SOA
 - find small effects, but significant place differences,

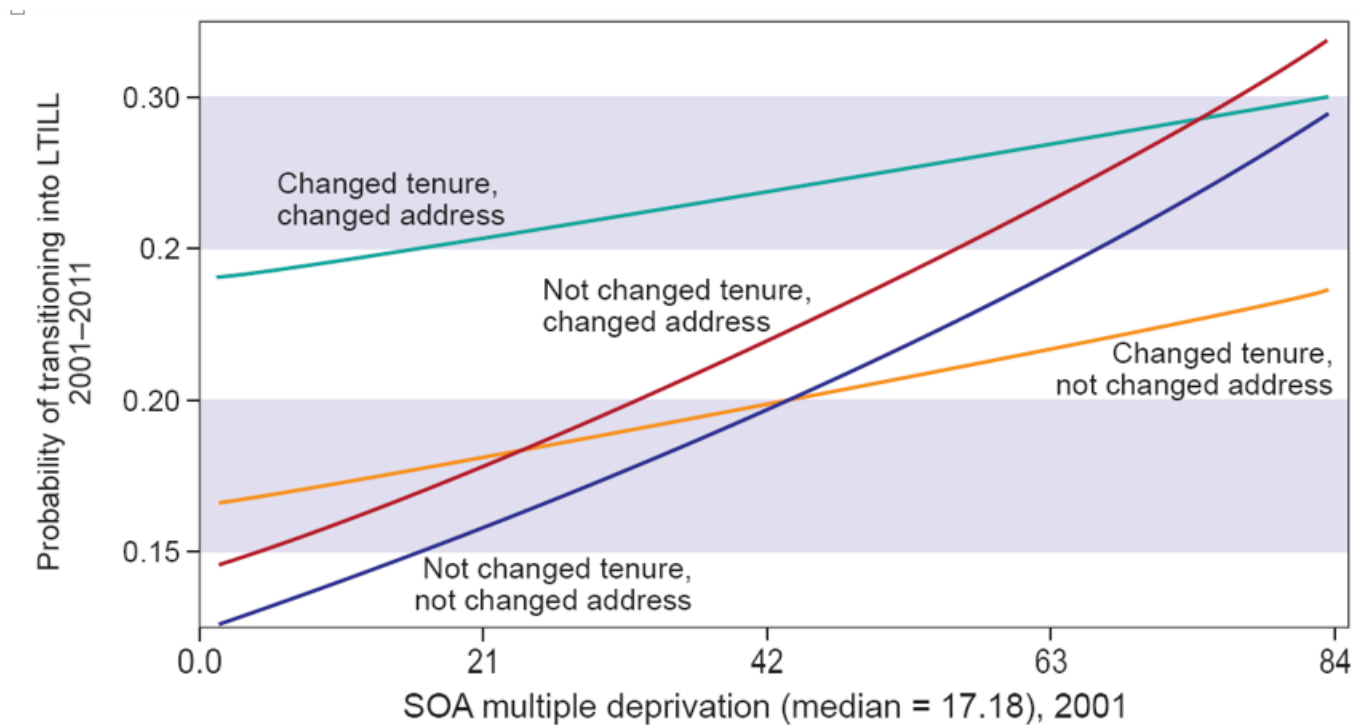
Modelling Spatial Concentrations: Health (Non)Transitions

Multilevel Models: Individual level & SOA LISA fixed effects, random SOA intercepts, Response: Staying ill (General health)

Cluster type (2001)	Nature of area-level fixed effects	
	Model 1: Limiting LT illness LISA	Model 2: Owner occupied LISA
Random	Base category	Base category
High, high	+ve large, significant	-ve large, significant
Low, low	-ve large, significant	-ve large, significant
Low, high	Not significant	Not significant
High, low	Not significant	Not significant

Modelling probability of transitioning to bad (ill)health

Cross-level interaction of individual & area effects



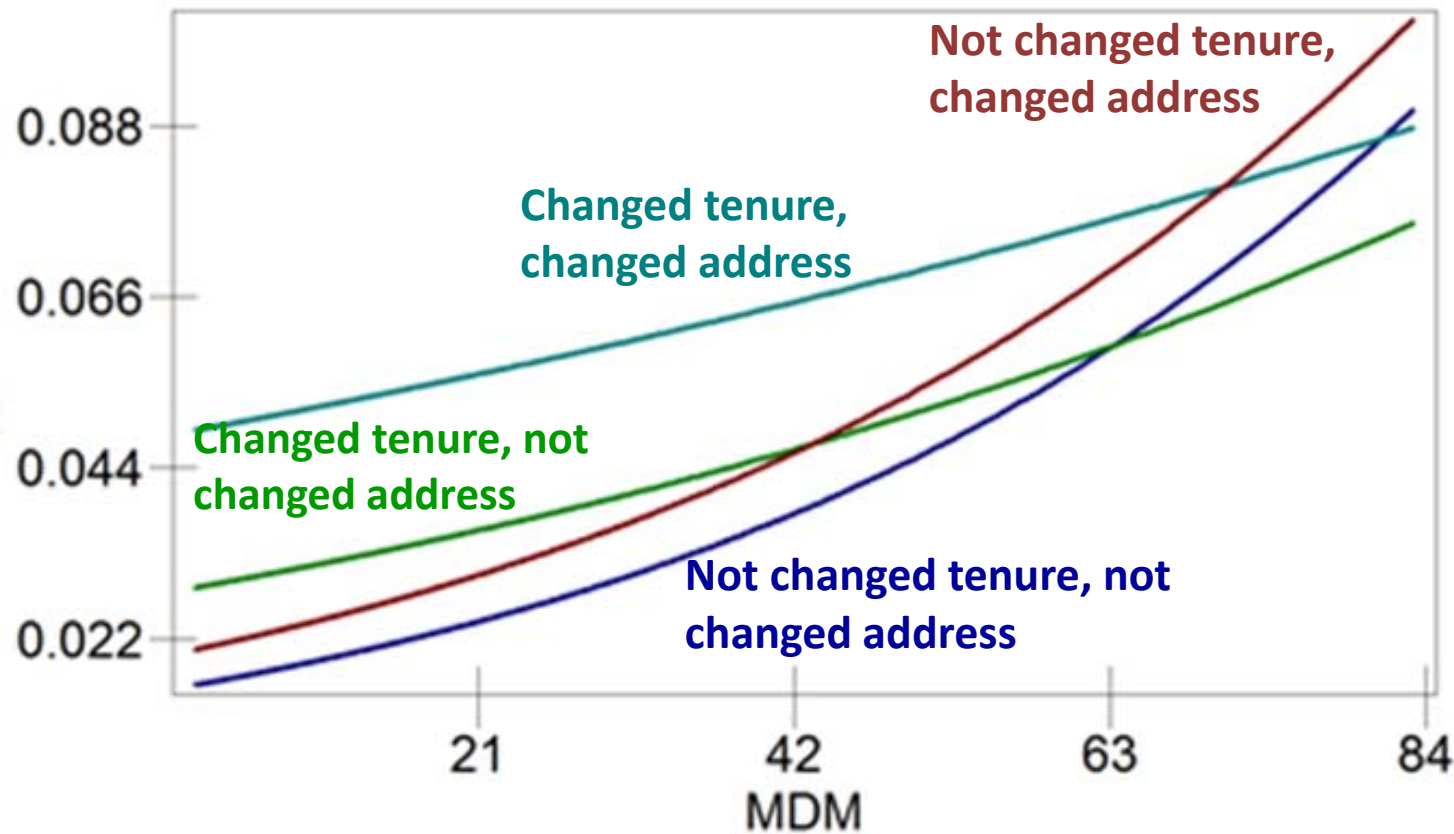
Source: Based on authors analysis of NLS

Figure 26.3 Cross-level interaction of individual changed tenure/address and multiple deprivation area effects on transitioning from no limiting illness to illness (Model 1)

Cross-level interaction of individual & area effects

(Response: Transitioning from good to bad general health)

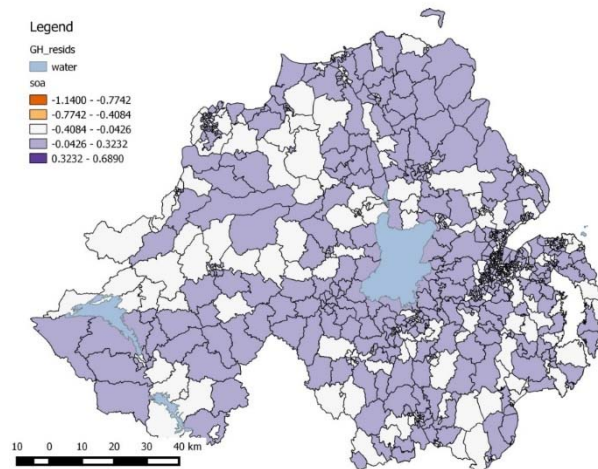
Prob. Transitioning from Good
to Bad Gen Health (2001-2011)



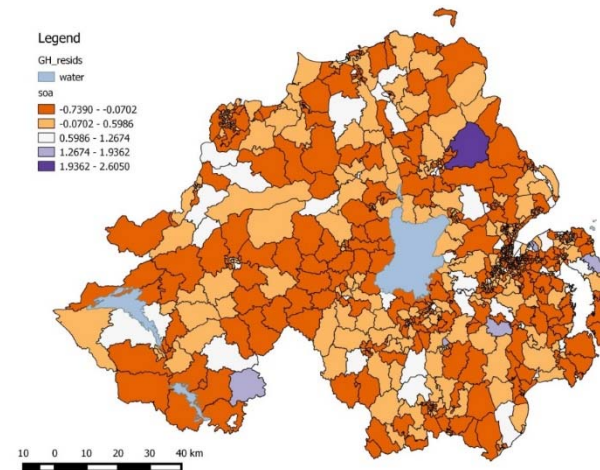
SOA Multiple Deprivation (md=17.8), 2001

Maps of MLM residuals: Cross-level interaction of address/tenure change & MDM deprivation (2001-2011)

*(Response: Transitioning Good to Bad General Health –
i.e. general health question)*



Random intercepts: Main effects & cross-level interactions



Variance components: for comparison

- Argue there is residual context variations, certainly not all contextual
- Consequence complex histo-political geographies of community background & housing markets (Shuttleworth, Gould, and Barr, 2014)

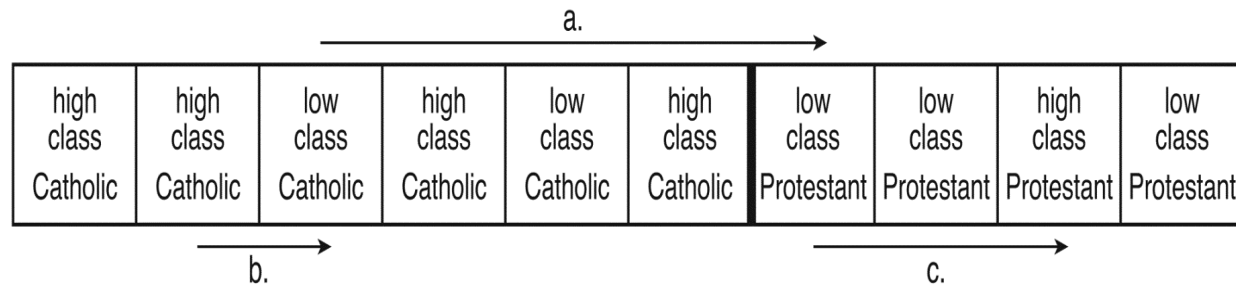
Conclusions (1)

- Sought to map and model considerable complexity: transitional states, compositional & contextual effects, & cross-level interactions
 - possible because of large & rich variable detail of NELS
- Health variations are not purely compositional
- Context (changing) matters to a degree but with complexity
 - both LISA analyses (aggregate Census data)
 - and cross-level interactions address/tenure change & tenure transition (NELS) with MDM
- We think both self-reported general health & LTILL Census questions captures people's well-being / happiness appropriately
 - comparative analyses of both questions is reassuring

Conclusions (2)

- Many types housing moves and social transitions through time with potential implications for health
 - both individual status and place changes
- Evidence of selective placement of the (un)healthy in different tenures / spatialities
 - Implications: tenure and spatial mobility (or its lack) linked to social residualisation
- Can't assign causality/directionality between health/tenure, or tenure/health
 - Requires quite different research designs (c.f. Smith & Easterlow, 2005)
- N. Ireland case study related to a particular devolved, social-historical and political context
 - Residential segregation/clustering is important

Northern Ireland: Segregation, Residential Movement & “Distance”



Source: Shuttleworth I, Gould M & Barr P. (2014) “Perspectives on social segregation and migration: spatial scale, mixing and places” in: I Shuttleworth I, C Lloyd & D Wong (eds), *Social Segregation: Concepts, Processes and Outcomes*, Policy Press.

hi	hi	lo	hi	lo	hi	hi	lo
P	P	P	P	P	P	C	C
hi	lo	hi	lo	lo	lo	hi	lo
P	P	P	P	P	C	C	C
lo	lo	hi	hi	lo	lo	hi	hi
P	P	P	P	C	C	C	C
hi	lo	lo	lo	lo	lo	hi	lo
P	C	C	C	C	C	C	C
hi	hi	hi	lo	hi	hi	lo	lo
C	C	C	C	C	C	C	C
hi	lo	lo	hi	lo	hi	hi	lo
C	C	C	C	C	C	C	C

P = Protestant hi = High social class
C = Catholic lo = Low social class

Source: Shuttleworth I, Barr P, & Gould M (2013) *Population, Space and Place*, 19(1) 60-71.

- In N. Ireland have to move large distances to change area with respect to community background (very segregated)
- To change to areas of different social economic status / deprivation, only need relatively short distance moves (less segregated)

Conclusions (3)

- Analytical & conceptual benefits through linking NLS microdata and CAS.
- Potential to link to NI Land and Property Service data
- NLS analytical power increasing to cover 5 censuses (1981 to 2021)
- Potential for other limited-life one-off data linkages through ADRC-NI (with 100% sampling)

Acknowledgements

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Gould, M. & Shuttleworth, I. (2018) "The Spatial-temporal Exploration of Health and Housing Tenure Transitions Using the Northern Ireland Longitudinal Study" in: J Stillwell (ed.), Routledge, Chapter 26, pp349-361, ISBN: 978-1-4724-7588-6.

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NILS-RSU Contact Details

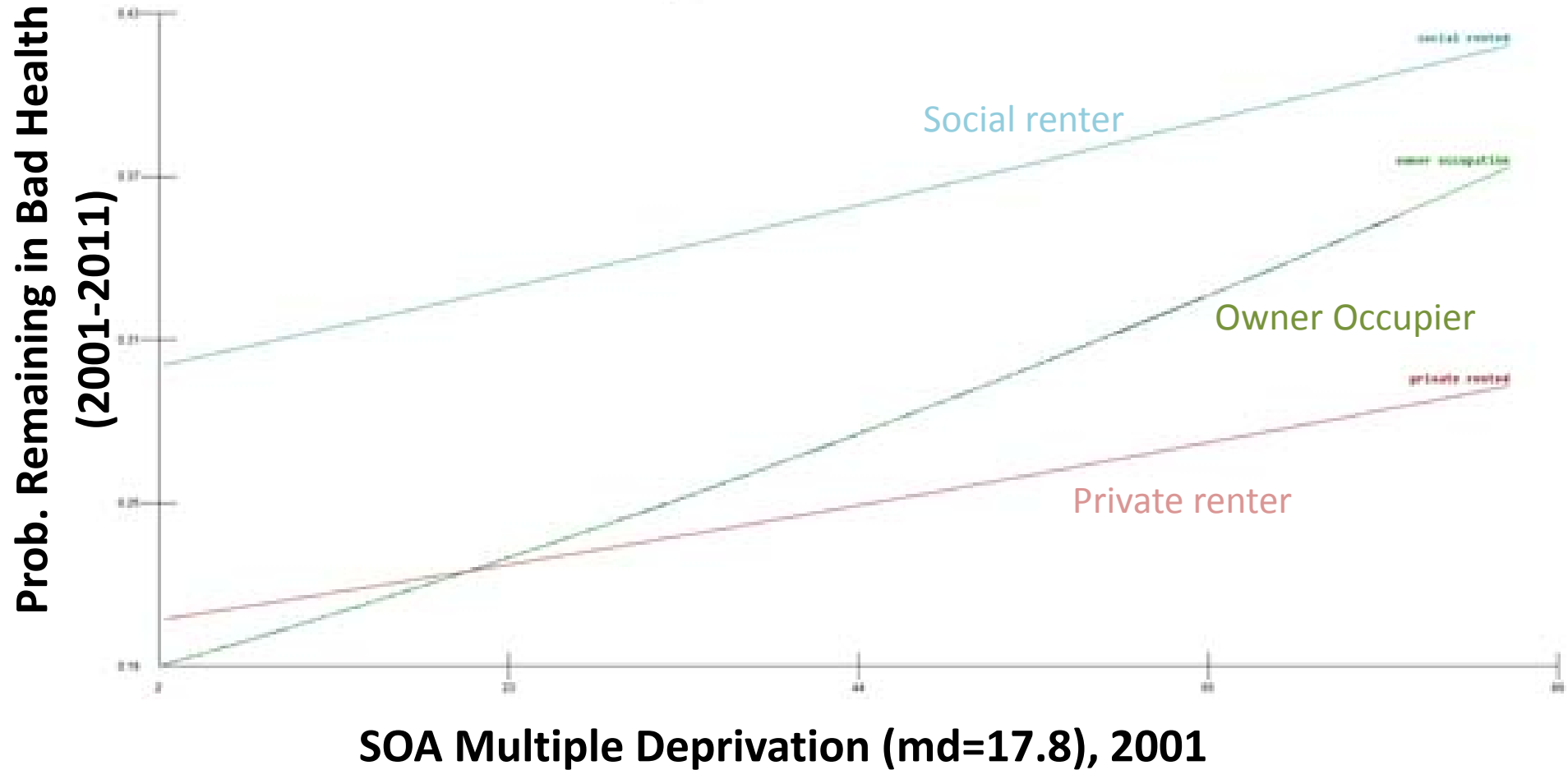
Web: <http://www.qub.ac.uk/research-centres/NILSResearchSupportUnit/>

Email: rsu@nisra.gov.uk

Modelling probability staying in bad (ill)health

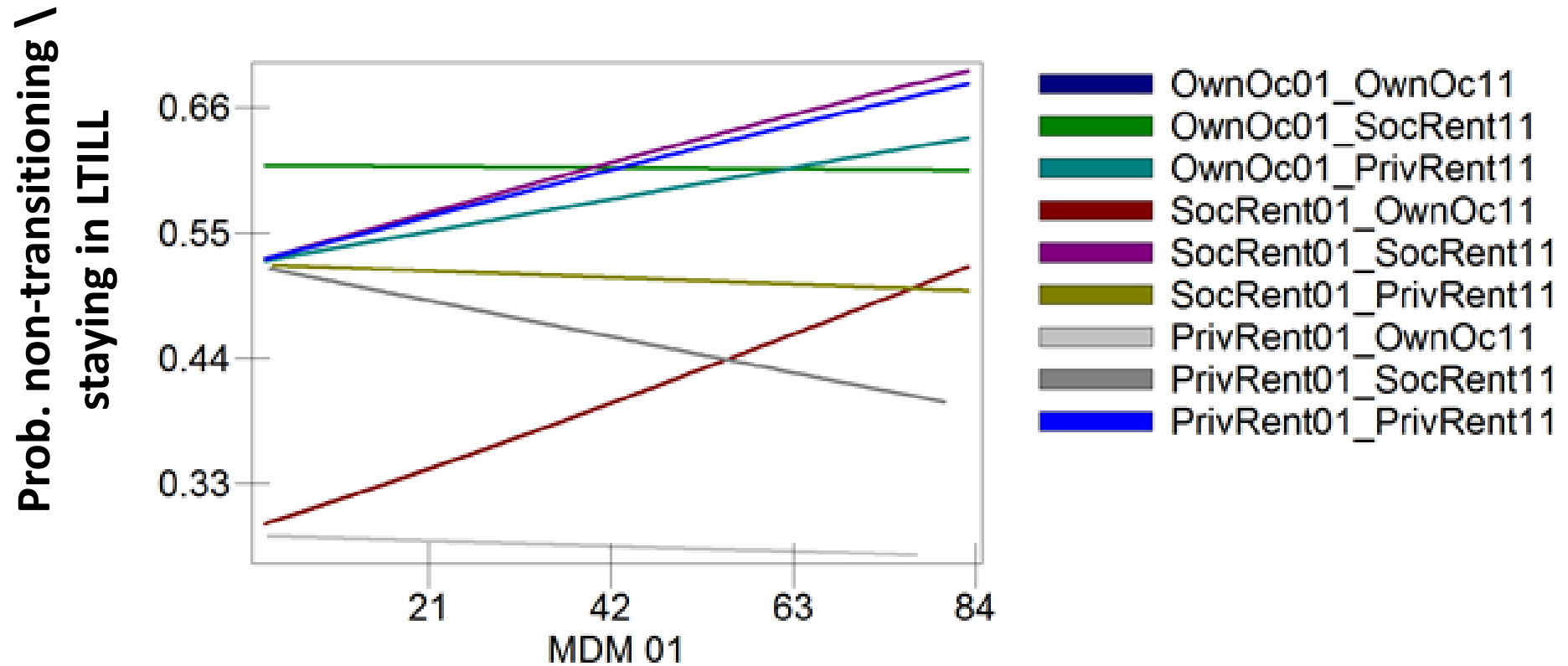
Cross-level interaction of individual & area effects

(Response: Staying bad health)



Cross-level interaction of individual & area effects

Response: Remaining ill (limiting long-term 2001-11)

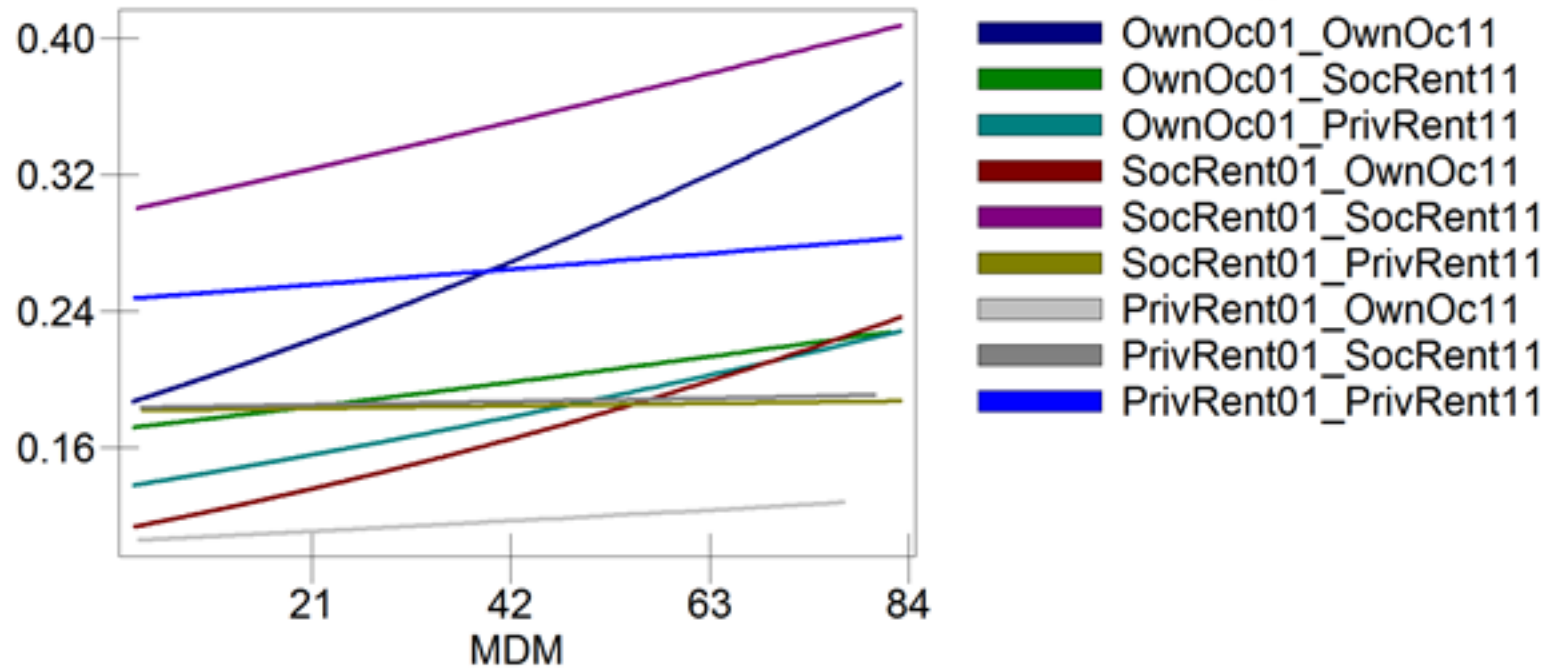


SOA Multiple Deprivation (md=17.8), 2001

Cross-level interaction of individual & area effects

Response: Staying bad health 2001-11 (General Health)

Prob. Remaining in Bad Health
(2001-2011)



SOA Multiple Deprivation (md=17.8), 2001